ASSIGNMENT 2

Textbook Assignment: "Forecasting Surface Systems (continued)," and "Forecasting Weather Elements." Pages 3-10 through 4-32.

2-1. When there are several waves along a front, the wave nearest the axis of the trough will normally develop at the expense of the others.

1. True
2. False

2-2. Assume you have a northwestward moving surface low situated over the eastern United States. The low is beneath the 10,700-m contour at the 200-hPa level. It is expected to move northeastward and be located beneath the 10,520-m contour at the 200-hPa level in 24 hr. If you use the approximation method, what would be the expected deepening of the low in 24 hr?

1. 7.2 hPa
2. 10.8 hPa
3. 13.5 hPa
4. 21.0 hPa

2-3. When a surface low moves beneath or ahead of the major ridge position at the 500-hPa level, what changes can be anticipated of the surface low?

1. The surface low will deepen
2. The surface low will fill
3. The associated weather will become more widespread
4. The surface low will move rapidly eastward

2-4. With a southerly flow at the 700-hPa level along the east coast of the United States, where can you anticipate development of a secondary low?

1. The northern Gulf of Mexico
2. Over the gulf states
3. Offshore, New England
4. The vicinity of Cape Hatteras

2-5. What would most likely occur in the lower stratosphere above the 300-hPa level if the column of air in a deepening low below the 300-hPa level were to become colder?

1. Subsidence in the lower stratosphere, resulting in warming and lowering of the constant pressure surfaces
2. Convergence in the lower stratosphere, resulting in cooling and lowering of the constant pressure surfaces
3. Subsidence in the lower stratosphere, resulting in cooling and lowering of the constant pressure surfaces
4. Convergence in the lower stratosphere, resulting in warming and lowering of the constant pressure surfaces

IN ANSWERING QUESTION 2-6, REFER TO FIGURE 3-8 IN YOUR TRAMAN.

2-6. Which of the following assumptions can be made from figure 3-8?

1. A surface high would exist to the left
2. The level of equal density is above the 200-hPa level
3. The tropopause layer is not significantly altered by the upper high
4. All of the above assumptions can be made

2-7. Assume that the upper current over a surface low is undisturbed and the low is deviating to the left of the upper contours (looking downstream). What should you forecast for this low?

1. The low should fill
2. The low should deepen
3. The low should split
4. The low should remain unchanged

2-8. Deepening lows always move more slowly than filling lows.

1. True
2. False

2-9. In the development of an anticyclone, what changes occur in the troposphere and lower stratosphere?

1. Warming occurs both in the 400- to 200-hPa stratum, and in the lower troposphere due to subsidence
2. Cooling occurs above the 400- to 200-hPa stratum, and warming occurs in the lower troposphere due to convergence
3. Warming occurs in the 400- to 200-hPa stratum due to subsidence, and cooling occurs in the lower troposphere due to convergence
4. Cooling occurs above the 200-hPa level due to convergence in the 400- to 200-hPa stratum, and warming occurs in the lower troposphere

2-10. Assume you are forecasting a surface high. YOU find that the 500-hPa height is NOT forecasted to increase, although convergence is occurring above 500 hPa. What should you forecast for this high?

1. It will split
2. It will weaken
3. It will intensify
4. It will remain unchanged in intensity

2-11. In regard to satellite imagery interpretation of intensity changes of surface cyclones, which of the following statements is valid?

1. Filling is indicated when Positive Vorticity Advection (PVA) becomes broader
2. High clouds surrounding a vortex indicate cold air advection
3. High and/or middle clouds surrounding a vortex indicate the cyclone has reached maturity
4. Deepening is indicated when PVA becomes narrower

2-12. The forecasting of frontal displacement by the geostrophic wind method should be based on which of the following components?

1. The geostrophic wind component parallel to the front obtained at the time of the forecast
2. The geostrophic wind component normal to the front obtained at the time of the forecast
3. A forecast of the mean component of the geostrophic wind, parallel to the front, which is expected to prevail during the forecast period
4. A forecast of the mean component of the geostrophic wind, normal to the front, which is expected to prevail during the forecast period

2-13. You should expect a front to have a rapid west-east movement with little southward penetration during what index cycle?

1. A low zonal index
2. A high zonal index
3. A changing zonal index
4. A decreasing zonal index

2-14. Which of the following movements would NOT indicate intensification of a surface front?

1. The surface front approaches a deep upper level trough
2. The mean isotherms become more normal to the surface front
3. The mean isotherms become more parallel to the surface, and tend to pack
4. Both air masses have strengthened due to the underlying surface

2-15. When the mean isotherms associated with a frontal system become more perpendicular to the surface front, what process should be anticipated?

1. Frontogenesis
2. Frontolysis
3. Cyclogenesis
4. Cyclolysis

2-16. Assume you a forecasting an isobar over you station. You find that the current 500-hPa height over your station is 5580-m and the forecasted value is 5640-m. The current 1000- to 500-hPa thickness is 5640-m, and the forecasted value is 5520-m. The current sea level pressure is 1029.0 hPa. What value should you forecast for the sea level pressure?

1. 1014.0 hPa
2. 1021.5 hPa
3. 1036.5 hPa
4. 1044.0 hPa

2-17. Which of the following processes is capable of producing precipitation in appreciable amounts.

1. Nonadiabatic cooling
2. Adiabatic lifting of air
3. Evaporation of additional moisture into the air
4. Radiation and conduction associated with advection

2-18. Adiabatic lifting of air can be caused by all EXCEPT which of the following cooling processes?

1. Frontal lifting
2. Orographic lifting
3. Vertical stretching
4. Horizontal divergence

2-19. Which of the followinq cooling processes is the most-effective and intensive?

1. Frontal lifting
2. Orographic lifting
3. Vertical stretching
4. Horizontal divergence

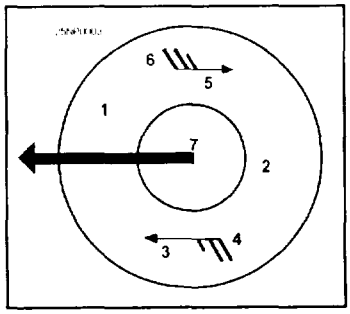

Figure 2-A

IN ANSWERING QUESTION 2-20, REFER TO FIGURE 2-A.

2-20. The most marked convergence occurs at what position?

1. 1
2. 2
3. 7
4. 4

2-21. Horizontal convergence, orographic lifting, or frontal lifting acting alone or in combination with one another can occur in any particular weather situation.

1. True
2. False

2-22. Which of the following processes will NOT prevent precipitation by increasing the temperature of the air?

1. Air descending the lee side of a mountain
2. Air descending from aloft to compensate for divergence of air from another region
3. Air descending because the mass ahead of a front is moving with a relative component away from the front
4. Air ascending the lee side of a mountain

2-23. When frontal weather extends far behind a surface cold front, the 700-hPa level isoheights will be at what relative position?

1. Perpendicular to the surface front
2. Parallel to the upper front
3. Parallel to the surface front
4. Perpendicular to the isotherms

2-24. Well-developed cloud bands noted on satellite imagery are associated with active cold fronts at the surface, and are the result of which of the following processes?

1. The veering of the winds aloft associated with the surface f rent
2. The backing of the winds aloft associated with the surface front
3. An upper wind flow that is nearly perpendicular to the frontal zone
4. An upper wind flow that is parallel, or nearly parallel, to the frontal zone

2-25. Excluding the cirrus cloud shield, what is considered to be the forward limit of warm frontal cloudiness?

1. The 500-hPa ridge ahead of the front
2. The 700-hPa ridge ahead of the front
3. The 850-hPa ridge ahead of the front
4. The 925-hPa ridge ahead of the front

2-26. The slope of a warm front is nearly horizontal near the surface, but is steep several hundred miles to the north. Where should the heaviest precipitation occur?

1. At the surface front
2. Immediately behind the surface front
3. South of the surface front
4. Where the slope of the surface front is greatest

2-27. What type of flow aloft tends to diminish cloudiness and precipitation?

1. Convergent flow
2. Cyclonic flow
3. Straight flow
4. Anticyclonic flow

2-28. Open cellular clouds are typically found in which of the following locations?

1. Stable air masses
2. The area immediately ahead of cold fronts
3. The cold air side of a cold front
4. The warm air side of a warm front

2-29. Closed cellular clouds are predominately composed of which of the following elements?

1. Cumuliform elements
2. Stratocumulus elements
3. Stratiform elements
4. Cirriform elements

2-30. Which of the following conditions is indicative of “fair weather”?

1. The relative vorticity increases downstream along the streamlines
2. The relative vorticity decreases downstream along the streamlines
3. The relative vorticity increases upstream along the streamlines
4. The relative vorticity remains constant along the streamlines

2-31. Satisfactory forecasting of the movement of precipitation areas by using isochrones may be obtained if the isochrones indicate areas that have what type of precipitation?

1. Continuous precipitation
2. Showery precipitation only
3. Intermittent precipitation only
4. Either showery or intermittent precipitation

2-32. Relative to the behavior of the cloud base and ceiling in an area of continuous precipitation, which of the following statements is accurate?

1. Both the ceiling and the cloud base will drop rapidly
2. Both the ceiling and the cloud base will drop gradually
3. The ceiling will drop gradually, and the cloud base will drop rapidly
4. The ceiling will drop rapidly, and the cloud base will drop gradually

2-33. Before an extrapolation of ceiling trends can be made by using the x-t diagram, which of the following conditions may necessitate the smoothing of the “curves”?

1. Diurnal ceiling fluctuations
2. Ceiling irregularities caused by topographic influences
3. Rapid and erratic up-and-down fluctuations of the ceiling
4. All of the above

2-34. What should be the first step in the construction of a “trend chart”?

1. Determine the source direction of the weather
2. Identify predictor station(s)
3. Determine the “critical factor”
4. Analyze the mesoscale situation

2-35. "Time-liners" are particularly useful for making the analysis and extrapolation of which of the following aids?

1. Trend charts only
2. Time-distance charts only
3. Isochrone analyses
4. Trend and time-distance charts

2-36. The temperature and dewpoint curves constructed on a RAOB may be used to determine the presence and thickness of cloud layers, as well as potential areas of cloud formation.

1. True
2. False

2-37. The temperature to which air must be cooled or heated adiabatically to reach saturation with respect to ice is the definition of what meteorological term?

1. Dewpoint
2. Potential temperature
3. Frost point
4. Relative humidity

2-38. Under what condition will the true temperature lie between the true dewpoint and the true frost point in a cloud?

1. When the cloud consists entirely of super-cooled water droplets
2. When the cloud temperature is above freezing
3. When the cloud consists entirely of ice crystals
4. When the temperature is representative of the sub-freezing portion of a cloud

2-39. A cirrus cloud is saturated with respect to water with a dewpoint of -31°C. What is the correct frost point to the nearest whole degree?

1. -22°C
2. -28°C
3. -34°C
4. -40°C

2-40. Assume that a sounding indicates a layer of moderate decrease in dewpoint depression, followed by another layer of stronger decrease in dewpoint depression. What assumption can be made relative to the cloud layer associated with the depression?

1. The top of the cloud layer should be identified with the base of the stronger decrease
2. The top of the cloud layer should be identified with the weaker decrease
3. The base of the cloud layer should be identified with the base of the stronger decrease
4. The base of the cloud layer should be identified with the base of the weaker decrease

IN ANSWERING QUESTION 2-41, REFER TO FIGURE 4-19 IN YOUR TRAMAN.

2-41. What is the probability of clear or scattered conditions when a sounding that terminated at the 850-hPa level indicates a dewpoint depression of 6°C?

1. 20%
2. 35%
3. 60%
4. 70%

2-42. Assume a 500-hPa level dewpoint depression analysis is constructed to determine the probable cloud areas. Where would cloud layers be indicated?

1. At the 500-hPa level only
2. At and below the 500-hPa level only
3. At and above the 500-hPa level only
4. At, above, and below the 500-hPa level

2-43. What is the greatest factor in determining the type and intensity of precipitation observed at the surface?

1. Cloud types
2. Thickness of the cloud types
3. Height of the base of the clouds
4. Temperature in the upper portion of the clouds

2-44. Most high-level jet operational problems are created by what type of cirriform clouds?

1. Cirrouncinus
2. Cirrocumulus
3. Cirrostratus
4. Cirrus (proper)

2-45. In the upper troposphere, what is the result of the slow ascent of air that has insufficient freezing nuclei in the higher levels?

1. The formation of cirrus haze
2. The formation of cirrocumulus clouds
3. The formation of cirrostratus clouds
4. The formation of “anvil” cirrus clouds

2-46. Assume that an aircraft is to fly through thin cirrus clouds in which the temperature is -35°C and the dewpoint is -37°C. What aircraft visibility should be forecasted?

1. 1 mile
2. 2 miles
3. 3 miles
4. 7 miles

2-47. A ridge line is approaching your station. You should forecast extensive cirrostratus clouds to occur at what period?

1. Before arrival of the 500-hPa ridge line
2. After passage of the 500-hPa ridge line
3. Before arrival of the surface ridge line
4. After passage of the surface ridge line

2-48. The mean height of the bases of cirriform clouds are greater at the equator than in the mid-latitudes.

1. True
2. False

2-49. Where are the densest and most extensive cirrus clouds found relative to the jet stream?

1. Below the jet stream axis
2. Above the jet stream axis
3. Poleward of the jet stream axis
4. Equatorward of the jet stream axis

2-50. The correct prediction of rain versus snow at a location depends mostly upon which of the following factors?

1. The height of the cloud bases
2. The temperature at the surface
3. The height of the freezing level
4. The temperature at the base of the cloud

2-51. In most precipitation situations, warming in the lower troposphere is generally expected to accompany the precipitation due to which of the following movements?

1. Strong warm air advection and upward vertical motion
2. Strong warm air advection and downward vertical motion
3. Cold air advection and strong upward vertical motion
4. Cold air advection and strong downward vertical motion

2-52. What is the primary cause of the lowering of the “bright band” within the first 1 1/2 hours after the onset of precipitation?

1. Vertical motion
2. Horizontal advection
3. Evaporational cooling
4. Combined effects of all of the above

2-53. A rain-snow zone is most closely tied to which of the following factors?

1. The position of the warm front
2. The position of the polar front
3. The direction of the surface winds
4. The track of the surface disturbance

2-54. Which of the following local thermal parameters used in a snow versus rain forecast is the LEAST reliable when considered by itself?

1. Stratum thickness
2. Surface temperature
3. Upper level temperature
4. Freezing level height

2-55. Wagner's study of the 1000- to 500-hPa thickness as a predictor of precipitation type in the United States verified which of the following statements?

1. Critical thickness values increase with increasing altitude
2. Critical thickness values increase with decreasing altitude
3. Critical thickness values decrease with increasing altitude
4. Critical thickness is unaffected by increasing or decreasing altitude

2-56. During periods of normal winter conditions, how far upstream should you look in forecasting a 24-hour temperature?

1. 200 nm
2. 300 nm
3. 400 nm
4. 500 nm

2-57. In what area of a blizzard should you expect maximum snowfall?

1. To the left of the storm's track
2. To the right of the storm's track
3. Along the storm's track
4. 100 to 300 nm equatorward of the storm's track

2-58. Which of the following is a characteristic of a warm advection type snowstorm?

1. An occluded low-pressure center to the east
2. A strong, active low-pressure center in the vicinity of the maximum snowfall area
3. The absence of a low-pressure center in the vicinity of the maximum snowfall area
4. An unoccluded low-pressure center to the east

2-59. What type of snowstorm may occur when a sharp, north-south oriented cold front lies in a deep trough?

1. Post-cold frontal
2. Warm advection
3. Major snowstorm
4. Blizzard

2-60. Maximum snowfall at any one station is of shortest duration if the snowstorm is of what type?

1. Blizzard
2. Warm advection
3. Post-cold frontal
4. Major storm

2-61. What 850-hPa level moisture isopleth and isotherm are used as the defining line for locating areas of maximum snowfall in the Great Lakes region of the United States?

1. The -10°C dewpoint isopleth and the -3°C isotherm
2. The -10°C dewpoint isopleth and the 0°C isotherm
3. The -5°C dewpoint isopleth and the -3°C isotherm
4. The -5°C dewpoint isopleth and the 0°C isotherm

2-62. Assume that yesterday the maximum temperature was 15°F and the lapse rate was stable; today, the lapse rate has become unstable while sky conditions have remained the same. How will today's temperature compare with yesterday's?

1. It will be greater
2. It will be the same
3. It will be less

2-63. all EXCEPT which of the following characteristics are prerequisites for a cold wave over the United States?

1. Strong northerly or northwesterly flow develops aloft over west central Canada
2. A strong ridge exists over the eastern portion of the United States
3. Intense southwesterly flow develops over the eastern Pacific ocean
4. An extremely cold Arctic air mass exists over west central Canada

2-64. A stationary long wave trough over the Rocky mountains in the summer always warns of a "heat wave" for the eastern United states.

1. True
2. False